

1. A retaining ring comprising:
a generally annular body having a top surface, a bottom surface, an inner diameter surface, and an outer diameter surface, wherein the bottom surface includes a plurality of channels, each channel extending from the inner diameter surface to the outer diameter surface and having a rounded ceiling.

2. The retaining ring of claim 1, wherein the rounded ceiling has a semi-circular cross-section.

3. The retaining ring of claim 2, wherein the semi-circular cross-section has a diameter about equal to a width of the channel.

4. The retaining ring of claim 1, wherein the rounded ceiling has a flat portion.

5. The retaining ring of claim 4, wherein the rounded ceiling is rounded at an intersection of the flat portion and vertical side-walls of the channel.

6. The retaining ring of claim 1, wherein each channel includes substantially vertical side-walls.

7. The retaining ring of claim 1, wherein the plurality of channels have substantially uniform depth.

8. The retaining ring of claim 1, wherein the plurality of channels are oriented at an angle relative to a radial segment extending through the center of the retaining ring.

9. The retaining ring of claim 8, wherein the angle is between 30° and 60°.

10. The retaining ring of claim 1, wherein the outer diameter surface includes a ledge.

11. The retaining ring of claim 10, wherein the outer diameter surface includes a first portion adjacent the bottom surface that has an outer diameter less than a second portion adjacent the top surface.

12. The retaining ring of claim 10, wherein the each channel includes substantially vertical side-walls, the side walls extending to substantially the same depth as the ledge.

13. The retaining ring of claim 1, wherein the annular body comprises a wearable material.

14. The retaining ring of claim 1, wherein the annular body comprises an upper portion and a lower portion, the upper portion being more rigid than the lower portion.

15. The retaining ring of claim 14, wherein the channels are formed in the lower portion.

16. The retaining ring of claim 15, wherein the lower portion is formed of a wearable material.

17. The retaining ring of claim 15, further comprising a plurality of passages extending through the upper portion from the inner diameter surface to the outer diameter surface.

18. The retaining ring of claim 1, wherein the plurality of channel are distributed at substantially equal angular intervals around the retaining ring.

19. A carrier head comprising:

a substrate receiving surface;

5 a generally annular retaining ring surrounding the substrate receiving surface, the retaining ring having a top surface, a bottom surface, an inner diameter surface, and an outer diameter surface, wherein the bottom surface includes a plurality of channels, each channel extending from the inner diameter surface to the outer diameter surface and having a rounded ceiling.

20. A method of polishing, comprising:

10 creating relative motion between a substrate and a polishing surface;

restraining the substrate with retaining ring that has a top surface, a bottom surface, an inner diameter surface, and an outer diameter surface, wherein the bottom surface includes a plurality of channels, each channel extending from the inner diameter surface to the outer diameter surface and having a rounded ceiling; and

15 supplying a polishing liquid to the polishing surface so that the polishing liquid flows through the channels and beneath the retaining ring to the substrate.